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ABSTRACT

Utilizing Appalachian culture to teach science on the secondary level, this guide considers some early Appalachian Indian and White practices and presents the scientific principles involved. First, the folk practice or procedure is described. Then scientific facts governing the situation are presented. Following directions for an experiment which demonstrates the scientific principles involved, the conclusion section discusses the folk custom in terms of the scientific principles. The section on Early Indian Ways describes various practices used by the Indians of Appalachia to survive and to improve their quality of life. The section on Mountaineer Ways also highlights early methods for improving the quality of life and for survival. There is a description of early food preservation and storage and of different uses of natural substances. Folklore is included as an historical science of Appalachia because it attempts to throw light on man's past in an inductive manner. (CM)

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SCIENCE AND APPALACHIA

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SCIENCE AND APPALACHIA

Berea College
Berea, Kentucky
July, 1977

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FOREWORD

The myriad of ideas and possibilities for Science and Appalachia seem to continue to burst forth in bedazzling rapidity as in some gala fireworks show. It is time now to catch some firey, burning spark that was a part of that brilliant unreachable heavenward burst that so quickly turns to cold darkness before us. The whole of that brilliance belongs to some Greater Force; yet ours is the spark with the capability of recreating a little of the amazing spectacle that the principles of science continue to present.

A little ball of mud taken from a perishing farm and containing a little strip of litmus within it may seem just a ball of mud.[1] Yet it contains one of those burning sparks. We can say in another language that the hydrogen ion indicator (ph) for the soil suggests that a bit of alkali (lime) would bring the soil to a ph more favorable to the growth of food plants. This scientific principle is the spark; while the use of this principle (food production) is the thrilling and brilliant starburst.

Many such "sparks" may be found in the practices of our Appalachian antecedents.

000 4

My appreciation is expressed to Professor Loyal Jones, Professor and Mrs. James Grossman, Dr. Larry Lipchinsky and United States Forester Leo Thiel, and to my classmates for suggestions about Appalachian practices and science.

All that man does involves some scientific principle. A night's sleeping while lying in bed involves the principle of reducing the number of muscles used against the force of the earth's gravity. The body has the power to eliminate the chemicals of fatigue during muscle rest periods, and on and on. Then, of course, we could even go into the principles used in building a bed, or of the covers for that bed.

Therefore, let us content ourselves with the selection of just a few of the activities that have allowed Appalachians to survive in hostile territory and have brought about some quality of life.

The subject is too large for me, but in the words of Sadie Grindstaff, "I figured anything anybody could do a lot of, I could do a little of, MEBBE."[2]

Margaret Blair Price
Berea College
Berea, Kentucky
July 4, 1977

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A BRIEF INTRODUCTION TO SCIENCE AND APPALACHIA

Man has always been concerned with survival and quality of life. Throughout the ages he has built up a body of knowledge that has enabled him to live in a right complicated style. To look backward in time, we are somewhat amazed to find that some of our antecedents could manage to live a fairly comfortable life by the standards of the age we view. Our present complicated life style has become so dependent upon this total body of knowledge that we begin to wonder how our antecedents ever managed on less.

Admiration for our successful antecedents and their particular knowledge, and a great curiosity of why these things worked, is cause enough for this investigation.

One definition of science is "systematized knowledge derived from observation, study and experimentation carried on in order to determine the nature or principles of what is being studied"; or even more simply "the state of fact of knowledge."[1] It is from either of these definitions that the term scientist is applied to our antecedents, for indeed they did observe and experiment (sometimes called trial and error) and accept the

1

procedure that worked for them; or they just accepted the "fact of knowledge" (I don't rightly know how, but hit works!) He has accepted and separated a procedure that works from the many that do not. Our Appalachian antecedents are great scientists, is a defensible statement according to this.

It is well to use some caution in our enthusiasm over our Appalachian scientists. "Unless one knows he is using something that is scientifically oriented then I don't know if we should give him credit for doing something scientifically. At what point do we make the distinction between science and living or just doing? Also who makes this distinction?" is a statement and questions of Dr. Larry Lipchinsky that are worthy of consideration.[2]

Our aim is to be fair and give credit to the discoverer of a procedure where such proof is presented and call that person the scientist, and those who follow the same procedure are the users of science. In the absence of such proof, many users of science are themselves scientists since they are rediscoverers of procedures. Let us be more concerned that our antecedents made choices about procedures based on whether it worked or not or served some useful purpose. Otherwise, in time, the faulty procedures were discarded.

EARTH SCIENCE

Historical Geology

The historical geology of Eastern North America suggests that in the Paleozoic and Devonian Periods, there was an ancestral Africa and ancestral Eurasia. There were the Acadian Mountains occupying the northern region. During the Appalachian Revolution, land and ocean changes came about so that the mass changes produced the crumpled folded earth that is now the Appalachian Mountains.[1]

The Appalachian area contains much natural wealth, the fossil fuels, coal and oil and natural gas. Oil shale is a reserve that can provide oil when other supplies are gone and less expensive extractive methods are found. Limestone, iron ore, gravels, glauconite containing potash for fertilizer, gravel, salt, high silicon content sand, building stone, a good water supply, and some hard timber are resources found here.

The shape of the area and its contents has affected the lives of Appalachians both physically and in a social context. Life in Appalachia brings challenges different from low lying flat lands.

ANTHROPOLOGY

Earliest Man to Appalachians

The discovery of the Australopithecine Zinjanthropus and Homo Habalis, dated as 2,000,000 years old, in Olduvai Gorge in Africa gives us strong indication that man had his earliest beginnings there.[1] Peking Man had been found earlier in China, but appears to be man at a later date. The connecting land mass of Asia Minor allows for ample conjecture that man could easily evolve and migrate from Olduvai Gorge in Africa on into China. Digging at Chou-kou-tien found skeletons classified as Mongoloid, Melanesoid and Eskimoid people.[2] This permits the belief that man was not stationary, but from earliest known times moved about the earth.

Anthropologists have already presented strong indications that man living in the northern most parts of Asia did cross over frozen seas and islands of the Bering Strait onto the Continent of North America and Alaska.[3] There is evidence that man migrated down the valleys and coastline of Canada and into what is now the United States. There were human societies in Appalachia as early as 8,000 B. C.[4]

These people with some Asian-Occidental characteristics are believed to be the American Indians. More and more evidence is being studied that points to this as a strong possibility and that this is the origin of the American Indians.

There is other evidence that the North and South Americas had immigrants from the opposite direction, that is, from Olduvai Gorge over the African continent to Western Africa and sailing in reed boats to the United States or Western Hemisphere.[5] These people are thought to have landed onto the South American Continent with some migrating northward into the North American Continent. There is much evidence of trade later on with established Indians of North America and those of the southern region now called Latin America. The land strips between make the people accessible to each other.

Some of the pre-Columbian Indians inhabiting the Southern Appalachians were the Adena, Hopewell and Middle Missippian cultures. These are the Mound builders who left much evidence about their burial and temple practices. The Mounds have contained "copper and iron breastplates and have necklaces, antlered headpieces made of copper, rings, beads, necklaces of pearls...and elaborate obsidian knives."[6] In other words, these early Indians had a fairly well advanced society.

Cabeza de Baca in 1528 is the first European of record in the Appalachian mountains.[7] The other Europeans that followed are a matter of history.

The preceding sets the stage and places the characters in the Appalachian area. These and their descendants, then, are our antecedent scientists.

The practices and procedures of these people, both the Indian and the White, with their scientific principles, is the subject of this investigation. "Facts of knowledge" as used by both Indian and White, and sometimes learned from each other, can provide facts for more elaborate study.

Consideration of some of the practices of these antecedents and a few relevant facts regarding some science involved is presented. No attempt is made to present many subjects in this manner, only enough to indicate the direction of a more extensive study that can be made. The idea of making the examples parallel any specific textbook has been abandoned in favor of listing relevant science facts about the practice. Textbooks change so quickly that such a work would be obsolete before started. It is left to the teacher to locate the stated principle in the particular text being used. The following examples are to serve as an idea of how the Appalachian Culture and Science can be combined for better understanding.

ANTE-BELLUM SCIENCE EDUCATION

The ante-bellum period of the United States had many fine schools for the teaching of Science. There were Southern schools like William and Mary of Tidewater, Virginia, Transylvania of Lexington, Kentucky, and many others all around the Southern Appalachians, but none completely in the mountains. Washington and Lee at Lexington, Virginia, was probably the closest, and the University of North Carolina not quite so close at Chapel Hill. Many of the colleges and universities studied the mountains at times, but they were based in a fringe area or far away.

The mountains were studied by such notable scientists as Elisha Mitchell of the University of North Carolina. Mount Mitchell is named for him.[1]

People traveled to some parts of the mountains for health, recreation and social purposes. One of the popular activities was to "botanize" in the mountains. The results of these social activities were large collections of botanical specimens that soon led to identification of nearly all the plants around.

Science lectures all over the South, particularly in the cities like Savannah and Richmond, were well attended

and advertised as very entertaining. On occasion the audience was asked to not keep time to the music.

A chapter in Johnsons' Scientific Interests in the Old South, is entitled "Sweet Southern Girls." Girls were taught courses in science so she would be conversant with gentlemen and, of course, "botanize." Scientific novels of the ante-bellum period usually featured a "sweet young girl" going to astronomy class taught by a handsome young teacher, or the delights and joys of collecting specimens of wild plants (botanizing), with the new science teacher and getting to know him better.

Not only "girls" attended things scientific, but so did the dear little old ladies.

In spite of these peculiarities about science education, some good was accomplished. Many science organizations developed that provided funds for important studies and equipment, and elaborate collections of specimens and data were made. Important scientific research and teaching did go on in spite of and because of this social interest in science.[2]

The Appalachian mountaineer learned his science another way. He learned from those close to him. Trial and error and accidental discovery was his informal training. He studied and "figgered" the best way to do things. Some of the ways turned out very well--he survived, didn't he?

BIOLOGY

Spider Webs, Cuts and Burns

Old Practice

Charlotte Madden, when interviewed by Darrel Madden, gives us the idea that spider webs can help stop bleeding; and that it can also be useful with burns.[1] A few spider webs laid over some cuts (not the larger ones that need to be held together by sewing or other means), or small oozing burns, make a good covering and promotes healing.

Relevant Facts

The body, through its circulatory (vascular) system of blood vessels and capillaries, not only supplies the needed nutrients to body cells, but also maintains an efficient waste disposal system for the entire body structure. Normal body function requires the maintenance of this system, even though it is subject to frequent injury.

It also has an emergency system ready to protect this two-way blood transportation system. A pin prick is enough to trigger the body's repair system, called coagulation and hemostases. The process which retains fluid blood within the circulatory system even with injury to the vessel wall

is called hemostases. Injuries to vessel walls that are considered self healing is accomplished through this process. Any vessel wall injury activates the hemostatic process, but it is relatively ineffectual with very large injuries without medical or surgical intervention. Hemostasis is most completely effective in the small or self healing injuries (cuts) to the vessel wall. The very small injuries just close immediately and the wall repairs itself. In another type, vasoconstriction takes place and lessens the flow of blood. At the same time blood dust or platelets clump together and cling to the vessel wall and act as a plug. The plasma, liquid portion of the blood, also undergoes a change that brings about a fibrin clot and reinforces the platelet plug. Together they form a framework for the repair process, a clot is formed as the result of a soluable plasma protein (fibrinogen) being turned into an insoluable polymer (fibrin). This polymerization is brought about through the action of the enzyme thrombin. Many other factors enter into the process and the fibrin becomes stable. The stabilized fibrin remains while the body repairs the injury.[2]

Demonstration

Whole blood may be had from an abattoir; in Appalachia at a hog killing. In a test tube or small glass bottle containing glass beads, collect a small amount of blood (15-20 cc will do). Shake thoroughly. A spongy mass

will form. This is fibrin. Lift out the fibrin and wash away the clinging blood cells with saline. Compare this fibrin mass with spider webbing. The spider webbing will have an even finer texture than the fibrin mass. Both will have small spaces between the fibers that could serve as a framework to build a stable configuration.

Consider what other substance has a similar network of fibers. Facial tissue or toilet tissue is a modern substance with such a characteristic and is often used to put over a small cut after shaving. Spider webs are not only similar but were available in earlier times.

Burns are injuries that involve plasma loss, the liquid portion of blood. Any network that could be used to build a blockade to prevent such loss would be helpful, even if it were spider webs.

Conclusion

Definite proof that spider webs help stop bleeding and plasma loss from cuts and burns cannot be made without reliable tests being conducted. It is concluded that because of the similarities of the component fibrin and spider webs, such tests could produce some positive results.

Dr. Charles A. Hentz, of Alabama, wrote for the University of Louisville, a dissertation entitled, "Family of Aronedes or Spiders-their Natural History-the Effects and Treatment of their Bite-and the use of their Web as an Article of the Materia Medica." Could Charlotte Madden's

spider web treatment receive greater recognition and prestige than to have it designated as "Materia Medica" and a famous University award one of its scholars the highest degree because of it.[3] Charlotte Madden, and the folk medicine she represents, you have made it to the top!

PHYSIOLOGY

Laxatives, Diuretics and Expectorants

The body is made up of many substances maintained in a very delicate balance. The body maintains this very delicate balance by several "input-output" systems. Respiration is one of these systems; urinary systems, the gastro-intestinal and others.

The air we breathe sustains us, but we exhale the discard gases. The necessary food and liquids are taken into the body and discard material is excreted through the gastro-intestinal and urinary tracts. Just the right amount of these substances taken in and excesses taken out helps maintain the delicate balance of just the right amount of substances. Some excesses take the liquid form out through the urinary system.

Sometimes these systems become overburdened or even sluggish while the discard substances pile up. Doctor Marguerite Tyler was fond of telling the chemistry class that laxatives were nothing more than poisons taken into the body in quantity enough for the body to respond by saying: "hurry up, lets' get rid of this load of poison, and it does."[1] The same idea can be applied to diuretics

and the urinary tract. The respiratory tract may become overburdened with germ-filled mucous, so an irritant (expectorant) is given and the patient coughs up the offending mucous.

Some substances used as laxatives were: castor oil, Eastern Wahoo or pegwood and boneset and slippery elm.

Diuretics were: purplestem angelica common milkweed, citronella and hypatica.

Expectorants used: Southern maidenhair, purplestem angelica, and Coltsfoot.

There were many others of varying degrees of effectiveness, but these are just a few examples.

ORGANIC CHEMISTRY

Corn Liquor

Old Practice

A farmer converted a field of corn into a few demi-johns of liquor (whiskey). He may then sling them over his shoulder if walking, or over the saddle if riding, and off he went to pay taxes, or more often trade for needed household items or cash. This was a sight easier than toting all that corn. Well, it is when he didn't pay the tax that it got to being called "moonshine."

Relevant Facts

Corn, a starch, is converted to a sugar and fermented into alcohol. Alcohol becomes a vapor (becomes volital) at a lower temperature than water, so the alcohol can be separated from the water and solids by capturing this vapor in a tube, cooling it, and collecting it in a nearly pure state. The amount of purity is its proof, 90 proof or 100 proof, etc.

Demonstration

Unless one is prepared to suffer the consequences (the "Federals," "concerned parents" and a "concerned

public") of distilling alcohol for educational purposes, it may be wiser to demonstrate fermentation, distillation and condensation in separate and disconnected ways.

A little flour, yeast and water allowed to stand a few days demonstrates fermentation. A drop of iodine on a sample of the mixture will turn purple as long as starch is present. As fermentation continues, there will be less and less starch so the iodine on the mixture will become a lighter purple color.[1]

A rubber stoppered flask fitted with a tube that is connected with another stoppered flask is sufficient equipment to demonstrate distillation and condensation. Equal amounts of water and rubbing alcohol is placed in the first flask and heated slowly while it sits in a pan of water on an electric hot plate (a safety measure). A vapor rises and passes through the tube into the second flask.

The tube can be cooled by keeping cold wet cloths around it. The droplets or distillate is alcohol (rubbing). A quick sniff of the second flask will tell you this is alcohol. Remove a few drops and test for flammability by using safety precautions and holding a lighted match to it. The liquid in the first flask is now mostly water. A weaker alcohol smell will remain in the first flask unless you are fortunate enough to stop at exactly half water and half alcohol in the two flasks. If you go beyond this point, then water is now condensing in the second flask.

It may also be helpful to discuss at this time drug abuse, as well as other uses of alcohol.

Condensation can be demonstrated by pointing to fogged windows or windshields of cars or a glass of ice water that is very moist on the outside.

CHEMISTRY

Cornbread and Biscuits

Old Practice

Our antecedents not only gave us our calories, but also had some preferences in making them more interesting and pleasant. Cornbread and biscuits did not depend upon yeast for raising, but upon a chemical action. A little soda in buttermilk made the bread rise. Careful not to put too much soda or the cornbread will turn green.

Relevant Facts

Buttermilk's lactic acid and sodium bicarbonate are the substances combined that release carbon dioxide in the oven, causing the bread to raise.

The same reaction occurs using sulphuric acid and soda, but that is better left to making fire extinguishers. This reaction is too violent and the strong sulphuric acid too corrosive for human consumption.

Vinegar (acetic acid) or lemon juice (citric acid) can produce carbon dioxide this same way, but the flavor is much stronger than the lactic acid combination. The chemical formula: $HC_3H_5O_3 + NaHCO_3 \rightarrow NaC_3H_5O_3 + CO_2\uparrow + H_2O$.[1]

Demonstration

Mix a little soda into either buttermilk, vinegar or lemon juice in a tube or bottle. Close with stopper supplied with tubing. Place end of tubing under water and watch for bubbling. A lighted match exposed to the bubbling will be extinguished by the escaping carbon dioxide.

Conclusion

The process is a good enough idea to be used today! Buttermilk biscuits taste good, too. Good enough for food packagers to use buttermilk in a dehydrated form to supply the demand, that's how good!

MORE SCIENCE AND APPALACHIA

A few examples of Appalachian Science have been stated. There are others that can be mentioned without going into great detail so that this introduction may not be prolonged unduly. This portion will be confined to mentioning the old practice and the direction of a few of the relevant facts that may be considered.

Early Indian Ways

Atl-Atl

The earliest Russell Cave inhabitants knew the use of the Atl-Atl. This hunting instrument, in effect, extended the length and use of man's arm. It could be thrown at game with considerable accuracy.[1]

Arrowheads

Flint arrowheads were made by exerting firm pressure with a river rock until the flint chipped. This pressure chipping process was repeated until the desired shape was completed.

Hunting Bow

The Indian hunting bow depended on a bow and the force produced by pulling its taut string and allowing it

to return to its own tension.

Forest Burning

The Indians sometimes burned small areas of the forests. This was done to keep enemies, human or predator animals, away. Sometimes fires were started by lightening. Small growth would spring up and provide nesting and food for small game. Here was where berries could be found.[2]

Glazed Pottery

Pottery became another of his skills. His knowledge of high silicon content soil could put a glaze on his creations.

Needles

He made needles of animal tendon and bones to sew his leather goods.[3]

Leather

He knew the tannic acid of oak trees, the sumac, for his leather goods. He knew some other methods, too, that had to do with rotting substances placed inside skins that broke down some tissue and produced very fine soft leather;[4] possibly an enzyme action.

Mountaineer Ways

Many of the Indian ways were learned by the mountaineers. Also the mountaineer had his way of doing things. Here are a few to consider.

Riving Shingles

Riving shingles has some interesting facts. The smooth cutting of a shingle would result in water being absorbed and eventually rotting it. But when the vascular bundles in logs were separated, fine grooves resulted and allowed the water to be channeled down and off the wood, leaving it to dry quickly. The froe was not too sharp since the idea was to separate the wood down the grain the same as a large wedge would do. The lever and fulcrum principle is used.[5]

Dehydration

Dehydration is a method of food preservation. Bacteria need nutrition and moisture to flourish. Take away moisture and one of the essentials to bacterial growth is gone. Beans and apples and even cabbage leaves were dried.

Pickling and Preserving

Pickling and preserving also allowed food to be kept for later use. Salt or acid solutions were taken into the structure of the plant or meat by osmosis. Fruits and vegetables took in sugar solutions by osmosis to make preserves.[6]

Pickling Crocks

Crocks used for pickling had to withstand acids, so a glaze was used. Silicon from the earth provides a fine one.

Apple Butter and Such

The making of apple or fruit butter involves reduction of water and a higher concentration of the natural sugars. This is also true of sorghum making.

Use of Lye in Hominy Making and Peach Peeling

The making of hominy involves the removal of a near waterproof cellulose that covers each grain of corn by the application of a strong, caustic lye. All traces of the lye is washed away, leaving the more easily eaten portion of the corn. This tough cellulose layer is taken care of in making corn meal by simply grinding it finely along with the rest of the grain. Fuzzy, unpalatable peach skins can be removed by the same lye process used with corn. A thorough washing removes any troublesome lye.

Butter, Buttermilk, Cheese, and Wine

The making of butter, buttermilk, cheese and wine takes advantage of the micro-organisms that are able to make some conversions. Growth of airborn bacteria increases the lactic acid in milk and produces butter and buttermilk along with its characteristic flavors.[7]

The variety of bacteria used in cheese making accounts for many flavors and consistencies.

Wine making involves bacterial growth in the fermentation process. Oxygen and a vinegar bacteria does just

that: produces vinegar or acetic acid instead of wine.[8]

Insulation: Food Storage

Insulation is a factor in several early practices. Vegetables were "holed up" for protection from cold and heat. The loose earth with its tiny air pockets was the insulator. Sometimes straw was placed in a dug out place where root foods or heavy skinned vegetables were kept. The straw provided a dry insulated space. It maintained an unfluctuating, not too hot nor too cold, temperature for food.

Insulation: Bedding

Insulation was important in quilts. The cotton fibers between the smooth top and bottom allowed the air spaces necessary for insulation.

The ornamental patterns of the woven coverlet provided insulation. Patterns of smooth linen areas alternating with higher wool areas produced numerous small air pockets that trapped air as insulation. Compare the warmth of this series of concave, convex surfaces with the coolness of a smooth linen sheet.

Temperature Maintenance: Rocks

There were other ways of controling temperatures. Rocks could be heated to high temperatures and put into the water heated for scalding at hog killing time. The hot water not only helped clean the meat, but also helped in removal of hog bristle. The rocks held the heat longer

and helped maintain a good supply of the needed scalding water.

A heated rock in a special container or fabric kept feet warm in bed or even at church meetings.

Temperature Use: Warm Air

At times the pioneer had little control over temperature. At such times he faced facts and took advantage of them. Hot air rises, so it was in the high warm places of the house that food was strung and stored high to keep it in a dehydrated state.

Temperature Use: Cool Air

He took advantage of the cool shady spot at his spring or well and stored such things as butter there.

Vegetable Dyeing

Color has some interesting details. Vegetable dyes predated the modern analine dyes. There is a large repertoire of vegetables and colors produced. Usually heat set the dyes in natural fibers.

Indigo in its natural state is insoluble in water, but by a fermentation process, it is converted into a water soluble substance that can penetrate the natural fibers. The indigo pot is a curiosity, and one is known to have been in constant use for a hundred years.[9] A mordant is used to fix the color.

Vegetable Dyeing: Mordants

Several substances were used as mordants. Mordants are substances that "bite" the resistant surface of the fiber wall so that the dye will cling or penetrate the fiber. Most mordants are acid, although alkaline substances are used in dyeing for various purposes.

Some mordants are:

Alum (aluminum potassium sulfate) found in white rocks. Romans used it and is documented by Pliny in Natural History.

Cream of tartar (potassium betartare) formed in process of wine making.

Chrome (potassium dichromate) orange crystalline substance very sensitive to light, gives orange-tan to mordanting. Dichromate is one of those strong substances used to clean laboratory glassware.

Tin (stannous chloride) white crystals, light sensitive, was used in 1100 A. D. in Cornwall, England. It should be used with care with wool; can cause brittleness.

Iron (ferrous sulfate) or (green vitriol or copperas) smelted and used for tools and containers in Asia Minor 200 B. C. As a mordant it is a "saddening agent" or deepens and darkens color and is too harsh and rough sometimes.

Blue vitriol (copper sulphate) treated, with ammonia, gives greenish blue dye similar to the Chilkat Indians of N. W. Pacific made by treating iron ore with urine.

Tannin (tannic acid). Tea leaves already have tannic acid in them.

Vinegar (acetic acid) gives a red dye bath, white vinegar is preferred and changes violet or purple dyes to reddish.

Oxalic acid strengthens a red dye bath.

Baking soda (bicarbonate of soda), additive making purple to blue.

Ammonia (ammonium hydroxide) helps to draw color out of grasses and lichens and may also sharpen yellows or green.[10]

Color: Clay and Other Sources

Color had other uses and came from many sources. Clay was colored by iron oxide pigment. Calcium was white; soot carbon was black and could be added to other colors to darken or lighten them.

A good grade of iron ore is a rosy pink and is an ingredient in some cosmetic rouge today. Other chemicals found naturally in the clay gave it a variety of colors. The composition of clay is usually hydrous aluminum silicate minerals.[11]

PHYSICS

Fulcrum, Lever and Wedge

Our antecedents developed excellent work practices without formal training in physics. The fulcrum and lever moved heavy weights such as cabin, building logs, and removal of rocks; smaller chores such as using an iron poker to lift a burning log to a better position in the fireplace.

The wedge split logs, or made heads stay on tools.

Gravity Forces

Most of the work of lifting, or transporting goods involved principles concerning the laws of gravity. A load rode better in the center of a wagon, not near the tailgate, where it could pull the front off the ground and into the air. A man could lift a load better if he could get under it instead of leaning over and pulling, although it is certain many activities required pulling.

The Wheel

A well needed a bucket to pull water up; but he got a wheel for a pulley as soon as he could.

Music

Music, with its decibels, vibrations, resonances, pitch, sound wave lengths, plucking, drumming and strumming, has laws of physics to adhere to.

Somehow our antecedents seemed to manage right well some laws of physics.

SOCIAL SCIENCES

Science of Folklore

Folklore not only includes the collection of the traditions of a people as it appears in popular fiction, custom and belief, magic and ritual, but also the science which attempts to study that material the same as some of the other disciplines, such as sociology.[1]

Folklore reconstructs the spiritual history of man.

"Folklore is an historical science: 'historical', because it attempts to throw light on man's past; a 'science', because it endeavors to attain, this goal, not by speculation or deduction from abstract principle agreed upon a priore, but by the inductive method, which, in the last analysis, underlies all scientific research, whether historical or natural."[2]

The inclusion of folklore as a science of Appalachia is for the purpose of calling attention to the many kinds of science that can be found here. The study of Jack Tales can be very scientific; the themes, the motifs, can be studied in a scientific manner.

Science can branch in another direction if we so desire. We could scientifically study the psychology of the people telling the tales, or the music, etc., and the

subject matter itself; their emotions and involvement could make a good study.

POSTSCRIPT

Again the ideas concerning Science and Appalachia keep flying about like fireflies on a summer's evening. Deadlines come, but there are other times and places to develop the single idea, Science and Appalachia, into a number of things, study courses, book, or wherever the reader or I may be led. You will have your own idea of its possible usefulness and application. Your thoughts can contribute to the future of this idea and the particular direction it should be taking.

Margaret Blair Price

FOOTNOTES

FOREWORD

[1]Dr. Marguerite Tyler, Chemistry Class, Athens College, Athens, Alabama.

[2]Jonathan Williams, An Ear in Bartram's Tree, A new Directions Paperbook (New York: 1969).

A BRIEF INTRODUCTION TO SCIENCE AND APPALACHIA

[1]David B. Guralnick, Editor in Chief, Webster's New World Dictionary, Second edition.

[2]A conversation with Dr. Larry Lipchinsky, Geology Department, Berea College, Berea, Kentucky, June 1977.

EARTH SCIENCE

Historical Geology

[1]William Lee Stokes, Essentials of Earth History, 3rd ed. (Englewood Cliffs, New Jersey: Prentice-Hall Incorporated, 1973).

ANTHROPOLOGY

Earliest Man to Appalachians

[1]Alexander Manshack, The Roots of Civilization (New York: McGraw-Hill Book Company, 1972), p. 73.

[2]Li Chi, The Beginnings of Chinese Civilization (Seattle 195070: University of Washington Press), p. 5.

[3]Richard B. Drake, Mountaineers and Americans, Berea College, Berea, Kentucky, 1976. Unpublished. p. 6.

[4]Ibid., p. 7.

[5]Thor Hyerdahl, The Ra Expeditions (Garden City, New York: Doubleday, 1971).

[6]Richard B. Drake, Mountaineers and Americans, quoting Robert Redfield, "Folk Society," American Journal of Sociology, Vol. 52 (1947), pp. 293-299.

[7]Ibid., p. 10.

ANTE-BELLUM SCIENCE EDUCATION

[1]Thomas Cary Johnson, Jr., Scientific Interest in the Old South (New York: D. Appleton Century Company, Inc., 1936).

[2]Ibid.

BIOLOGY

Spider Webs, Cuts and Burns

[1]Charlotte Madden, Taped interview by Darrel Madden, May 31, 1976, Appalachian Oral History Program, Alice Lloyd College, Pippa Passes, Kentucky.

[2]Todd and Sanford, Clinical Diagnosis by Laboratory Methods, edited by Israel Davidsohn, FACP, and John Bernard Henry, M. D. W. B. Saunders, publications, Philadelphia, 15th edition.

[3]Thomas Cary Johnson, Jr., Scientific Interests in the Old South (New York: D. Appleton Century Company, Inc., 1936), p. 193.

PHYSIOLOGY

Laxatives, Diuretics and Expectorants

[1]Dr. Marguerite Tyler, Chemistry teacher, in a lecture at Athens College, Athens, Alabama.

ORGANIC CHEMISTRY

Corn Liquor

[1]David W. Maurer, Kentucky Moonshine (Lexington, Kentucky: The University Press of Kentucky, 1974), pp. 1-11.

CHEMISTRY

Cornbread and Biscuits

[1]Prof. James Grossman, in conversation, Berea College, Berea, Kentucky, 1977.

MORE SCIENCE AND APPALACHIA

Early Indian Ways

[1]Russell Cave, Alabama, where the U. S. Parks Service gives a demonstration of atl-atl throwing and allows visitors to do it themselves. Our whole family learned to throw the atl-atl. The museum there also shows gorgets that had traveled from Mexico to Russell Cave possibly by way of known trade routes.

[2]U. S. Forester Leo Thiel, Berea, Kentucky, in conversation, June 1977.

[3]Dr. McMichael, archaeologist, West Virginia University, at dig site, Mt. Carbon, West Virginia.

[4]Prof. James Grossman, in conversation at Berea College, Berea, Kentucky, June 1977.

Mountaineer Ways

[5]James McClure, in demonstration at his Kentucky farm, June 1977.

[6]Prof. James Grossman, in conversation at Berea College, Berea, Kentucky, June 1977.

[7]Henry H. Wing, Milk and Its Products (London: The McMillan Company, 1920).

[8]David W. Maurer, Kentucky Moonshine (Lexington, Kentucky: The University Press of Kentucky, 1974).

[9]Ms. Persis Grayson, lecture at Berea College, Berea, Kentucky, June 1977.

[10]Palmy Weigle, Ancient Dyes for Modern Weavers (New York: Watson-Gypstill Publications, 1974), pp. 14-15.

[11]David B. Guralnick, Ed. in Chief, Webster's New World Dictionary of the American Language, 2nd ed., The World Publishing Company, New York.

SOCIAL SCIENCES

Science of Folklore

[1]Alexander H. Krappe, The Science of Folklore (New York: W. W. Norton and Company, Inc., 1964), p. XV.

[2]Ibid.

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